PROJECT FACT SHEET

CONTRACT TITLE: Characterization of Reservoir Rocks and Fluids by Surface Electromagnetic Transient Methods

DATE REVIEWED: 01/08/93 **DATE REVISED:** 12/23/92

OBJECTIVE: objective is to The enhance the resolution capabilities two-dimensional subsurface imagery surface using based transient electromagnetic (TEM) data in order to enhance reservoir characterization.

ID NUMBER: DE-AC22-89BC14476

B & R CODE: AC0530/35/40

CONTRACT PERFORMANCE PERIOD:

02/15/90 to 05/15/92

PROGRAM: AEPT

RESEARCH AREA: Geoscience

DOE PROGRAM MANAGER:

NAME: Dr. Arthur Hartstein COMMERCIAL: (301) 903-2760

DOE PROJECT MANAGER: NAME: Robert E. Lemmon

LOCATION: BPO

COMMERCIAL: (918) 337-4405

CONTRACTOR: Blackhawk Geosciences, Inc.

ADDR:

17301 W. Colfax Ave., Ste 170

Golden, CO 80401

CONTRACT PROJECT MANAGER:

NAME: Dr. Pieter Hoekstra, President

ADDR: Blackhawk Geosciences, Inc. 17301 W. Colfax Ave., Ste 170 Golden, CO 80401 PHONE: (303) 278-8700 FAX: (303) 278-0789

PROJECT SITE: Golden, CO

SCHEDULED MILESTONES:

Complete site selection.	10/90
Complete development and testing of imaging algorithms.	11/90
Complete establishment of necessary data acquisition parameters.	05/91
Complete numerical evaluation of proposed methods.	05/91
Complete field operations plan.	01/91
Complete collection of TEM field data and analysis.	04/91
integration of results and final report.	03/92
Submit draft final report.	05/92
Submit final report.	07/92

FUNDING (1000'S)	DOE	· OTHER	CONTRACTOR	TOTAL
PRIOR FISCAL YRS FISCAL YR 1993 FUTURE FUNDS	274 0 0	0 0	0 0 0	274 0 0
TOTAL EST'D FUNDS	274	0	0	274

PROJECT DESCRIPTION: The proposed work of 2-dimensional (2-D) subsurface imaging of surface based transient electromagnetic (TEM) data is designed to enhance the resolution capabilities of the method. The development of 2-D subsurface imaging will be combined with the development of practical 2-D numerical modeling algorithms and a field study. The purpose of the subsurface imaging is to provide a practical method for interpreting large volumes of TEM data in areas where the earth is stratified or 2-dimensional. The field study will be conducted in an area where the subsurface geology is known so that the numerical modeling and subsequent image development can be evaluated against the known.

PRESENT STATUS: Completed.

ACCOMPLISHMENTS: A final report was submitted in July 1992. A brief synopsis of the accomplishments contained in the report follows. The research was conducted along three linked paths: (1) The selection of a test site and the acquisition of a high density TEM data set, (2) Finite element forward modeling and (3) TEM 2-D subsurface imaging.

The major achievements of the imaging method under this research program are:

- (i) The method has been proven to be fundamentally sound. It yields a geoelectric section consistent with known geology and with realistic absolute values of resistivity, and
- (ii) The geoelectric section derived is based on matching both horizontal and vertical magnetic fields, and makes full use of high station density. This is an improvement of 1-D analyses where at present only the vertical magnetic field is utilized.

BACKGROUND: Electrical exploration methods can be and have been applied to a number of cross-cutting objectives for geoscience reservoir characterization and modeling of enhanced recovery processes. Such applications include mapping contacts between hydrocarbon and brine saturation in shallow producing horizons, monitoring the conductive zones in steam flooding and combustion drives, and mapping structure in areas of incomplete seismic data (ex. volcanic covered terrain, overthrust areas and permafrost covered terrains). Current applications of TEM soundings are aimed at 1-D structures in both survey design and interpretation procedures. The application of 2-D subsurface imaging and numerical modeling will have a far reaching impact on the manner in which TEM sounding data is collected and interpreted, and will significantly enhance the applicability of the method in electrical exploration.